

Turbo 2 ultrafast - high voltage rectifier

Main product characteristics

I _{F(AV)}	5 A
V _{RRM}	600 V
T _j	175° C
V _F (typ)	1.1 V
t _{rr} (max)	30 ns

Features and benefits

■ Ultrafast switching

■ Low reverse current

■ Low thermal resistance

■ Reduces conduction and switching losses

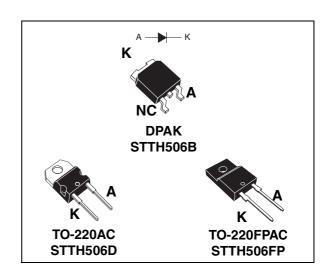
■ Insulated package TO-220FPAC

Insulated voltage: 2500 V_{RMS}

- Typical package capacitance: 12 pF

Description

The STTH506 uses ST Turbo2 600V technology. This device is specially suited for use in switching power supplies, and industrial applications.



Order codes

Part Number	Marking
STTH506B	STTH506B
STTH506B-TR	STTH506B
STTH506D	STTH506D
STTH506FP	STTH506FP

Table 1. Absolute ratings (limiting values per diode at 25° C, unless otherwise specified)

Symbol	Pa	Value	Unit		
V _{RRM}	Repetitive peak reverse voltage	Repetitive peak reverse voltage			
1	RMS forward current		TO-220AC, TO220FPAC	20	Α
'F(RMS)			DPAK	10	Α
,	Average femueral ourrent S = 0.5	T _c = 145° C	TO-220AC, DPAK	5	Α
I _{F(AV)}	Average forward current, $\delta = 0.5$	T _c = 120° C	TO-220FPAC	5	Α
	Surge non-repetitive ferward current $t_p = 10 \text{ ms}$		TO-220AC, TO220FPAC	70	Α
I _{FSM} Surge non repetitive	Surge non repetitive forward current	Śinusoidal	DPAK	55	Α
T _{stg}	Storage temperature range				°C
T _j	Maximum operating junction temperature ⁽¹⁾			175	°C

^{1.} $\frac{dP_{tot}}{dT_j} < \frac{1}{R_{th(j-a)}}$ thermal runaway condition for a diode on its own heatsink

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Table 2. Thermal parameters

Symbol	Parameter		Value	Unit
D	Junction to case	TO-220AC, DPAK	3.5	° C/W
Hth(j-c)		TO-220FPAC	6	C/ VV

Table 3. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Тур	Max.	Unit
I _R ⁽¹⁾	Reverse leakage current	T _j = 25° C	V - V			5	μA
'R` ′	R heverse leakage current	T _j = 150° C	$V_R = V_{RRM}$		13	130	μΛ
V _E ⁽²⁾	Forward voltage drop	T _j = 25° C	I _E = 5 A			1.85	V
V _F · Forward voltage drop	T _i = 150° C	IF = 5 A		1.10	1.40	'	

- 1. Pulse test: $t_p = 5$ ms, $\delta < 2$ %
- 2. Pulse test: t_p = 380 μ s, δ < 2 %

To evaluate the conduction losses use the following equation: $P = 1.07 \text{ x I}_{F(AV)} + 0.066 \text{ I}_{F}^{2}_{(RMS)}$

Table 4. Dynamic characteristics

Symbol	Parameter	Test conditions		Тур	Max.	Unit
t Payaraa raaayary tima		$I_F = 0.5 \text{ A}, I_{rr} = 0.25 \text{ A}, I_R = 1 \text{ A},$ $T_j = 25^{\circ} \text{ C}$			30	ns
۲rr	t _{rr} Reverse recovery time	$I_F = 1 \text{ A, } dI_F/dt = -50 \text{ A/}\mu\text{s,}$ $V_R = 30 \text{ V, } T_j = 25^{\circ} \text{ C}$		35	50	119
I _{RM}	Reverse recovery current	$I_F = 5 \text{ A}, dI_F/dt = -100 \text{ A/}\mu\text{s},$ $V_R = 400 \text{ V}, T_j = 25^{\circ} \text{ C}$		3.5	5	
t _{fr}	Forward recovery time	$I_F = 5 \text{ A}$ $dI_F/dt = 100 \text{ A/}\mu\text{s}$ $V_{FR} = 1.1 \text{ x } V_{Fmax}, T_j = 25^{\circ} \text{ C}$			180	ns
V _{FP}	Forward recovery voltage	$I_F = 5 \text{ A}$ $dI_F/dt = 100 \text{ A/µs}$ $V_{FR} = 1.1 \text{ x } V_{Fmax}, T_j = 25^{\circ} \text{ C}$		4		V

Figure 1. Conduction losses versus average current

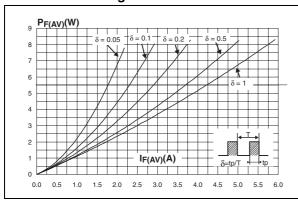
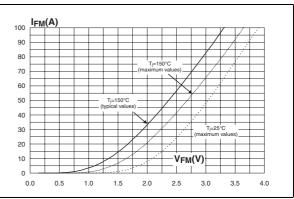


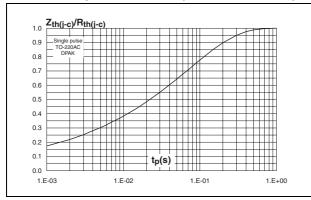
Figure 2. Forward voltage drop versus forward current



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Figure 3. Relative variation of thermal impedance junction to case versus pulse duration (TO-220AC, DPAK)

Figure 4. Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAC)



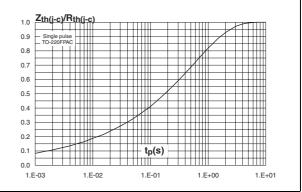
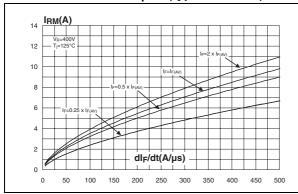


Figure 5. Peak reverse recovery current versus dl_F/dt (typical values)

Figure 6. Reverse recovery time versus dl_F/dt (typical values)



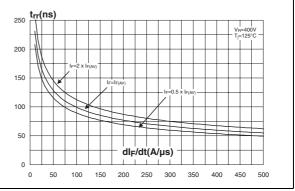
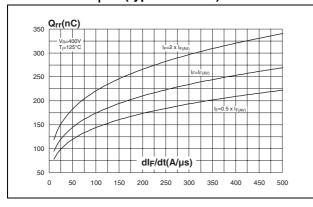
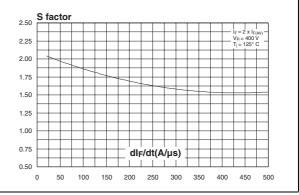


Figure 7. Reverse recovery charges versus dl_F/dt (typical values)

Figure 8. Softness factor versus dl_F/dt (typical values)

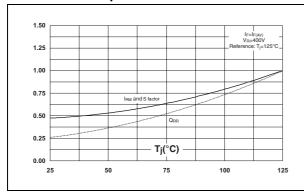




Characteristics STTH506

Figure 9. Relative variations of dynamic parameters versus junction temperature

Figure 10. Transient peak forward voltage versus dl_F/dt (typical values)



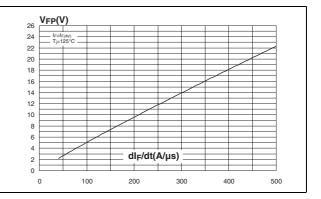
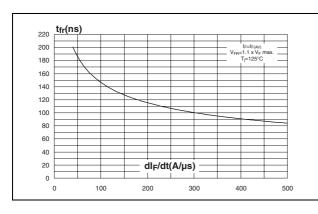


Figure 11. Forward recovery time versus dl_F/dt (typical values)

Figure 12. Junction capacitance versus reverse voltage applied (typical values)



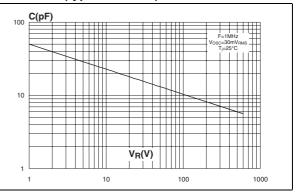
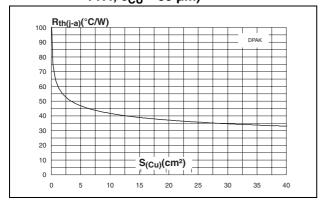


Figure 13. Thermal resistance junction to ambient versus copper surface under tab (printed circuit board FR4, e_{CU} = 35 μ m)



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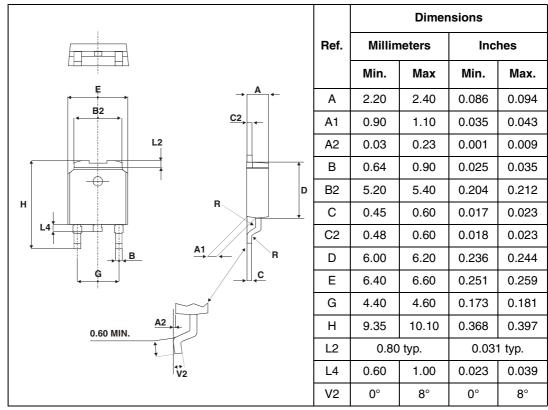
2 Package mechanical data

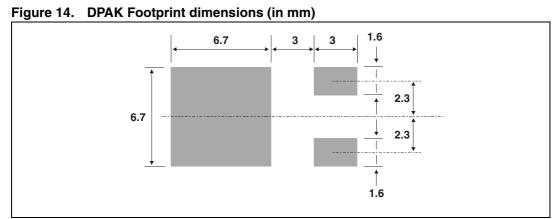
Epoxy meets UL94, V0

Cooling method: by conduction (C)
Recommended torque value: 0.80 Nm

Maximum torque value: 1.0 Nm

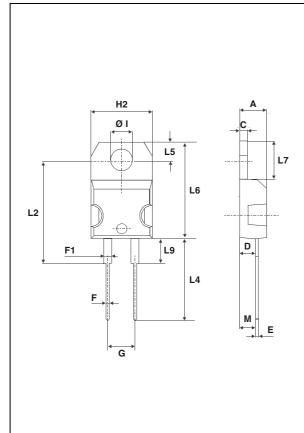
Table 5. DPAK Dimensions





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Table 6. TO-220AC Dimensions



	Dimensions			
Ref.	Millimeters		Inc	hes
	Min.	Max.	Min.	Max.
Α	4.40	4.60	0.173	0.181
С	1.23	1.32	0.048	0.051
D	2.40	2.72	0.094	0.107
Е	0.49	0.70	0.019	0.027
F	0.61	0.88	0.024	0.034
F1	1.14	1.70	0.044	0.066
G	4.95	5.15	0.194	0.202
H2	10.00	10.40	0.393	0.409
L2	16.40) typ.	0.645 typ.	
L4	13.00	14.00	0.511	0.551
L5	2.65	2.95	0.104	0.116
L6	15.25	15.75	0.600	0.620
L7	6.20	6.60	0.244	0.259
L9	3.50	3.93	0.137	0.154
М	2.6	typ.	0.102 typ.	
Diam. I	3.75	3.85	0.147	0.151

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Table 7. TO-220FPAC Dimensions

	Dimensions			
Ref.	Millimeters		Inc	hes
	Min.	Max.	Min.	Max.
Α	4.4	4.6	0.173	0.181
В	2.5	2.7	0.098	0.106
D	2.5	2.75	0.098	0.108
Е	0.45	0.70	0.018	0.027
F	0.75	1	0.030	0.039
F1	1.15	1.70	0.045	0.067
G	4.95	5.20	0.195	0.205
G1	2.4	2.7	0.094	0.106
Н	10	10.4	0.393	0.409
L2	16	Тур.	0.63 Typ.	
L3	28.6	30.6	1.126	1.205
L4	9.8	10.6	0.386	0.417
L5	2.9	3.6	0.114	0.142
L6	15.9	16.4	0.626	0.646
L7	9.00	9.30	0.354	0.366
Dia.	3.00	3.20	0.118	0.126

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

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Ordering information STTH506

3 Ordering information

Part Number	Marking	Package	Weight	Base qty	Delivery mode
STTH506B	STTH506B	DPAK	0.3 g	75	Tube
STTH506B-TR	STTH506B	DPAK	0.3 g	2500	Tape and reel
STTH506D	STTH506D	TO-220AC	1.86	50	Tube
STTH506FP	STTH506FP	TO-220FPAC	1.8 g	50	Tube

4 Revision history

Date	Revision	Description of Changes
18-May-2006	1	First issue.

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